THE CANTILEVER BRIDGE OF THE COLORADO.

BY MRS. M. BURTON WILLIAMSON.

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In Southern California we seldom mention the size of our rivers. Excepting during the winter rains, our rivers are tabooed as a dry subject. The fact that the wonderful system of irrigation utilizes almost every drop of available river water, makes them seem to easterners little more than creeks in the summer time. Then, besides the irrigation drain of the rivers in Southern California, these streams have a habit of sinking below their sandy beds in the dry season.

But the river that marks the boundary between Southern California and Arizona, the Colorado River, is an exception. This river, after running through the most wonderful chasm or system of gorges known in the world, runs its course through the Colorado Desert down to the Gulf of California in Mexico.

At the foot of the Mohave Mountains, thirteen miles below the quaint little town called "The Needles"—so named because at this place there is a group of sharp spires in the Mohave Mountains—the cantilever bridge crosses the Colorado River between Arizona Territory and California.

Travelers bound for the Pacific Slope, crossing this bridge at the Needles, are often informed that they are entering the "Land of Sunshine" on the "longest single span cantilever bridge in the world, with one exception." Although this is taken as an extravagant bit of local pride, yet it was strictly true when the bridge was built. Dr. James P. Booth, surgeon of the Bridge Company, says of the cantilever bridge of the Colorado River built in 1890, having a total length of 960 feet, with a single span 660 feet, that at the time of its completion it was the "longest unsupported bridge span in the world, excepting that of the bridge at the Firth of Forth," at Queen's Ferry, Scotland. According to the Glasgow Citizen, this bridge, at Queen's Ferry, is one of the wonders of the world. It has two spans, each of them 1700 feet, and the bridge cost 4,000,000 pounds.

The first cantilever bridge built in the United States was the Niagara bridge, built in 1883, at that time it was the first of any magnitude in the world, the Firth of Forth bridge not having been built. It was considered a marked advance in engineering. It may seem paradoxical, but the principle of the cantilever bridge is found in the simplest and earliest forms of bridge building. Chambers' Encyclopedia says the Japanese "would lay two balks of timber embedding one in one bank and the other in the other bank, with their ends projecting over the stream so as to form two cantilevers, and would then add a center balk, reaching from one to the other;" and that a good bridge of this kind was built in Japan over "two hundred years ago." So much for the simple form or principle of the cantilever. The term itself is defined as meaning a "bracket."

The long span of the present system of cantilever, illustrated in the Niagara bridge, having a total length of 910 feet, with its single span of 470 feet—according to the Scientific American—was outrivaled by the cantilever bridge of the Colorado, whose span, as has been noted, was 660 feet.

There are other cantilever bridges in the United States, one crosses the Hudson at Poughkeepsie, N. Y.; one crosses the Ohio at Lousville,, Ky.

Dr. James P. Booth, whom I have mentioned as surgeon of the Bridge Company, has very kindly furnished me with data on this subject. In a letter he says: "On account of the unsafe condition of the wooden bridge, which spanned the Colorado three miles directly east from the town of the Needles, it was resolved by the A. and P. Company to construct an iron bridge ten miles (thirteen miles from the Needles) further down the stream. This work was begun in September, 1889, and the first train crossed the bridge on May 10, 1890.

"The preliminary work consisted in sinking down to bed rock, which was done by caissons, and building up above the point of high-water mark on both sides of and in the river, two huge pillars of stone and cement. This work was done by Sooy, Smith & Co. of Chicago. The ends of the iron bridge are securely anchored by heavy masonry to the mainland on either side, while the greatest portion of the weight is thus brought to bear upon the two pillars. The bridge—that is, the iron work— was built and put up by the Phœnix Bridge Company of Phœnix, Pa., and is said to be one of the finest and most substantial bridges in the world." Dr. Booth gives the

length and cost of building this bridge, as noted before. He further says:

"In the photograph sent you, you will observe something resembling a platform near the center of the bridge. This photograph was taken before the bridge was completed and the platform is what the builders called 'the traveler.' This 'traveler' went ahead of the work, carrying material for the construction of the bridge, and paradoxical as it may appear, the bridge was built behind the 'traveler.' Two iron rails extended beyond the work upon which the wheels of the 'traveler' rolled, and thus it was that the 'traveler' was enabled to precede the bridge itself.

"The building of these bridges is usually very perilous work and the principal workmen are experts. Indeed, to one watching the progress of building, it appears a trade in itself. The management informed me that they usually lost from eight to twelve men in the construction of a bridge, but in the building of this bridge there were but three killed. One was blown up by a premature blast of rock, one had a hand car of heavy iron topple over and crush him, and the third fell from the top of the bridge to the ground on the California side just after the work was begun.

"Boats (steamers) pass under the bridge now during the high water season without any difficulty, and the expense of a draw bridge, which was a necessity with the old bridge, is entirely done away with."

Is it any wonder that Arizonans and Californians join in calling the link that connects the Territory and the State "the great cantilever bridge?" It was an evolution in bridge building that no one could have contemplated a quarter of a century ago.